

Denver forecast district.—November was colder than usual. A cold wave warning was issued at 8 p. m. the 27th for eastern Colorado. This was not technically verified but there was a decided fall in temperature. A local cold wave occurred at Pueblo, Colo., on the 24th, the temperature having fallen 24° to 19° at that place in 24 hours, but the fall of temperature at surrounding stations was moderate during that period.—A. H. Thiessen.

San Francisco forecast district.—November, 1920, was unusually stormy in this district. Abundant rains fell in northern California, southern Oregon, and northern Nevada. The amount of snowfall in the Sierra Nevada Mountains was much greater than at the same time a year ago. In southern California, southern Nevada, northern Oregon, Washington, and northern Idaho the precipitation was deficient, due in southern California and southern Nevada to the storm tracks not being far enough south to cause the usual amount of rain. The deficiency in the north was due to a preponderance of high-pressure areas over the Canadian Northwest.

Temperatures averaged nearly normal and there were no severe cold spells, though on many mornings frost formed in the Sacramento and San Joaquin Valleys.

Coastwise shipping suffered a few disasters and many delays on account of the number of stormy days along the coast. On November 5 the barkentine *Edward May* from Callao for the Columbia River, reported that she was about 100 miles off San Francisco for 10 days bucking strong northwest gales. She began leaking badly and put into San Francisco for repairs.

Steamer *G. C. Lindauer* was driven ashore during the night of November 16 by a heavy storm at Albion, Calif. This ship was floated on November 24. Part of her keel was lost through the mishap, but otherwise she escaped in good condition.

The steamer *Joan of Arc* went ashore on the beach near Battle Rock, Port Orford, Oreg., during the night of November 15–16. The crew, including two women, were picked up by lifeboats by the *City of Topeka*. This vessel, valued at \$250,000, became a total loss.

Schooner *Bangor*, from Sydney for San Francisco, had her headgear carried away in a strong southeast gale on November 16 while in latitude 39° 8' north and longitude 124° 5' west.

The steamer *Westport* was seven days off Crescent City, Calif., after the 16th awaiting a chance to get into the harbor, which she was prevented from doing on account of rough weather.

The Chilean steel barge in tow of the steamer *Santa Rita* went ashore November 26, at Cape Johnston, on the Washington coast south of Cape Flattery. This vessel carried a crew of 14 men and the captain's wife and child were aboard of the vessel. The ship was valued at about \$200,000. Fourteen lives were lost and only two of the crew were saved. The ship and cargo will be a total loss.

Steamer *Tamalpais* was blown ashore in Crescent Harbor on November 26. She became waterlogged, but was afterwards towed to Hoquiam, where her cargo was discharged and repairs were made.

Advisory warnings were sent to shipping interests in this district on the 1st, 14th, and 30th for storms to be encountered on the first or second day after leaving this coast. In addition, storm warnings were displayed at one or more places on 11 days and small craft warnings on four days. These warnings for the most part were timely and undoubtedly of benefit to mariners.

Frost warnings were issued frequently for northern California and twice for southern California. They were generally verified, though of no great benefit, as the frosts were not heavy enough to cause any great amount of damage.—E. A. Beals.

RIVERS AND FLOODS.

FLOODS DURING NOVEMBER.

By H. C. FRANKENFIELD, Meteorologist.

[Dated, December 29, 1920.]

There were no serious floods during the month of November, and those that occurred were in the smaller rivers, as will be seen from the following table:

Flood stages during month of November, 1920.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
ATLANTIC DRAINAGE.					
Roanoke:	<i>Feet.</i>			<i>Feet.</i>	
Weldon, N. C.....	30	{ 18	19	34.0	19
		30	(1)	35.1	30
Neuse:					
Neuse, N. C.....	14	17	19	16.3	17
Smithfield, N. C.....	14	18	21	17.2	19
Santee:					
Rimini, S. C.....	12	20	21	12.6	20
Ferguson, S. C.....	12	22	22	12.0	22
MISSISSIPPI DRAINAGE.					
Scioto:					
Larue, Ohio.....	11	23	24	11.0	23, 24
Circleville, Ohio.....	10	24	24	10.0	24
WEST GULF DRAINAGE.					
Trinity:					
Trinidad, Tex.....	28	2	2	28.0	2
PACIFIC DRAINAGE.					
Sacramento:					
Red Bluff, Calif.....	23	19	19	23.2	19
Willamette:					
Eugene, Oreg.....	10	27	27	11.5	27

¹ Continued into December.

The lower Roanoke River was in flood on the 18th and 19th. This rise was unusual for the time of the year, and was a rapid one following a 2 to 4 inch rainfall after a dry period, the rainfall having been heaviest over the central portion of the watershed. Warnings were issued on the 17th, and the crest stage at Weldon, N. C., was 34 feet, or 4 feet above the flood stage, on the 19th. Warnings were also issued on the 17th for the Neuse and Cape Fear Rivers. In the Neuse River the crest stages were from 2 to 3 feet above the flood stages, but the warnings for the Cape Fear River failed owing to the closing of the dam at Buckhorn Falls power plant, 7 miles below Moncure, N. C. This cut off 9 feet from the normal rise at Fayetteville, N. C. Advice had been received that the water at the dam had been virtually emptied, but after the warning had been issued the gates were closed and the rise held up. Another and greater rise was in progress in the Roanoke River on the last day of the month and report thereon will be made next month.

Matured crop losses were about \$5,000, and about \$15,000 worth of property were saved through the warnings.

Warnings of flood stages in the Pedee River at Cheraw, S. C., were issued on the 17th, but failed decidedly. The failure was due to unreported deficiencies of precipitation over a portion of the upper watershed and to the drawing

down of 14 feet of water in one pool of great storage capacity, also unreported. The filling of this pool after the rains materially reduced the sharp rise in the river, and another pool farther down further flattened the flood crest that remained.

Warnings of marked rises were also issued on the 17th for the lower Saluda, lower Broad and Congaree Rivers of South Carolina. These warnings were justified. Copious rains below Camden and Columbia, S. C., also caused moderate flood stages in the Santee River. There was no loss or damage.

Moderate local floods occurred in the Scioto River of Ohio on the 23d and 24th, but apparently no damage was done.

For the first time in the history of the Bismarck, N. Dak., station, warm weather caused the early breaking up of the ice in the Missouri River after it had been frozen to such an extent that teams and automobiles could cross. This occurred on November 15, 23, and 27, at Williston, N. Dak., and at points below on November 29. Warnings of the coming of the ice and rising waters were issued a sufficient time in advance for precautionary measures to be taken. A new highway bridge is in course of construction across the Missouri River at Bismarck, and the timely warnings enabled the workmen to escape with their lives. The only damage was the tearing out of the trestle of the new bridge, and amounted to only a few thousand dollars. After the ice passed out a steamboat was brought up from Deapolis to Bismarck, marking the latest navigation ever known on the Missouri River in North Dakota.

The moderately high stages in the lower Trinity River of Texas during the early days of the month were forecast in the latter part of October. There was no damage of consequence, as live stock had previously been removed to places of safety.

The only other floods occurred in the upper Sacramento and the Willamette Rivers. The flood in the upper Sacramento was caused by torrential rains that began on November 15 and continued until late evening of November 20. The 24-hour rainfalls at Kennett, Calif., during this period were as follows:

	Inches.
16th.....	4.70
17th.....	6.50
18th.....	7.84
19th.....	4.34
20th.....	4.38
21st.....	2.85
Total.....	30.61

Below Kennett the rainfall did not average more than 6 inches. The river was at very low stage when the rains began, and flood warnings were issued on the 18th for Red Bluff and Tehama, Calif.

The crest stage at Red Bluff was 23.2 feet, 0.2 foot above the flood stage, at 5 a. m., November 19, with a proportionate rise at Tehama. The crest at Knights Landing, Calif., was 17.2 feet, 0.8 foot below the flood stage, at noon, November 22, and at Sacramento 22.8 feet, 6.2 feet below the flood stage, at 4 p. m., November 23.

Although but little water escaped over the levees along the lower river, local drainage caused considerable damage to the rice and bean crops, about 40 per cent of which had not been harvested. The value of property saved through the warnings, mainly in the shape of live stock, was not less than \$50,000. A few cattle, sheep, and hogs were drowned.

The flood in the Willamette River was a local one, with flood stage at Eugene, Oreg., only, where the crest stage was 11.5 feet, 1.5 feet above the flood stage, on November 27. This flood was caused by almost persistent, although not very, heavy rains during the second and third decades of the month. No damage was reported.

MEAN LAKE LEVELS DURING NOVEMBER.

By UNITED STATES LAKE SURVEY.

[Dated: Detroit, Mich., Dec. 3, 1920.]

The following data are reported in the "Notice to Mariners" of the above date:

Data.	Lakes. ¹			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during November, 1920:				
Above mean sea level at New York.....	<i>Feet.</i> 602.48	<i>Feet.</i> 580.30	<i>Feet.</i> 571.95	<i>Feet.</i> 245.23
Above or below—				
Mean stage of October, 1920.....	—0.20	—0.25	—0.10	—0.06
Mean stage of November, 1919.....	+0.03	—0.12	—0.27	—0.88
Average stage for November, last 10 years.....	—0.04	+0.02	+0.08	—0.41
Highest recorded November stage.....	—1.03	—2.62	—1.72	—2.59
Lowest recorded November stage.....	+0.98	+1.12	+1.25	+1.82
Average relation of the November level to—				
October level.....		—0.20	—0.30	—0.20
December level.....		+0.20	+0.10	+0.20

¹ Lake St. Clair level: In November, 574.97 feet.

EFFECT OF WEATHER ON CROPS AND FARMING OPERATIONS—NOVEMBER, 1920.

By J. WARREN SMITH, Meteorologist.

For the most part the weather during November, 1920, was favorable for outdoor operations, although work was delayed in portions of the South by considerable wet weather, while the low temperatures in central and northern States during the second decade were unfavorable for farm work. Rainfall was heavy in much of the Atlantic coast section the latter half of the month, but the weather was mostly fair throughout the month from the Mississippi Valley westward to the Rocky Mountains.

It was favorable for harvesting and drying corn in most of the principal corn-growing States and satisfactory progress was made in harvesting the crop. Considerable corn was reported soft and chaffy in some central Mississippi Valley districts.

Heavy rain in the eastern and northeastern portions of the cotton belt the latter part of the month delayed picking in that section, but otherwise the weather was mostly favorable for gathering cotton still in the field. Picking progressed slowly, however, in the northwestern portion of the belt, and the staple of the unpicked cotton steadily deteriorated on account of its exposure to the weather. Considerable low-grade cotton was abandoned in Texas.

Winter grains continued to make satisfactory progress throughout the month in nearly all sections of the country under the influence of generally favorable weather. At the close of the month winter wheat was in good to excellent condition and was steadily improving, although rain was needed in a few interior sections. The general